the glass industry

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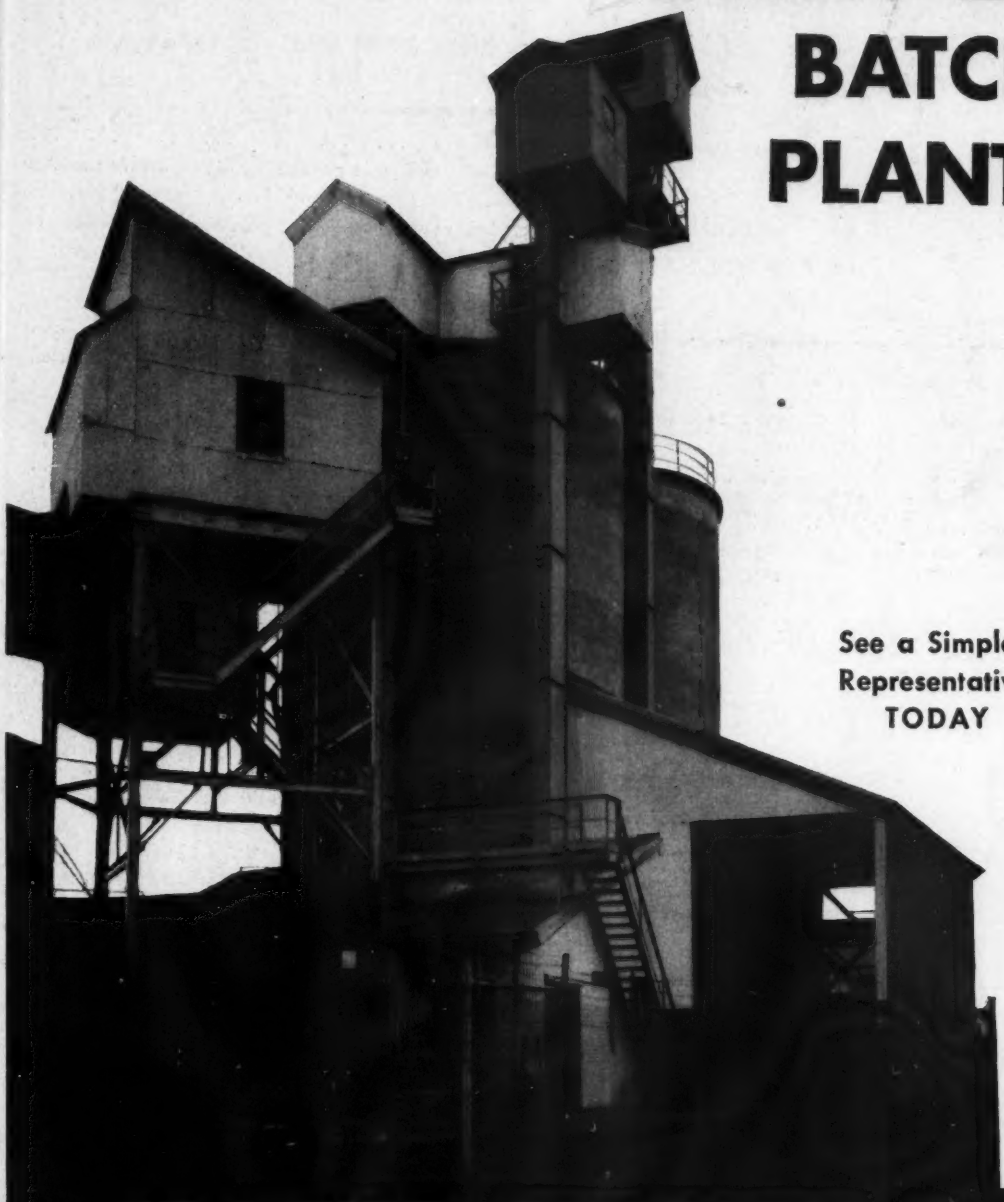

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the glass industry

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THE GLASS INDUSTRY

VOLUME 26, NUMBER 1, JANUARY, 1945

FURNACE OPERATION AND CONTROL

(FURNACE "HEAT-UP")

By ROY S. ARRANDALE

Thatcher Manufacturing Company, Elmira, N. Y.

PART I

A few weeks ago I attended a lecture given by a foremost expert in his field, on the application of electronics to industry. As many as perhaps fifty slides were shown, covering many ingenious applications of electronic devices to industry in general—not one of them to glass. After the meeting and per suggestion to the speaker that after all, we had lots of problems that we needed help on too, he replied jokingly that yes, there had been many glass factory problems brought to his attention but they were all so "stinky" that they had not been able to do much in the way of a clean-cut application of existing equipment!

It does seem that in problems connected with glass factory operation in general, the various phenomena do not lend themselves to exact analysis. Where several variables are involved it is seldom that we change one independently of the others, having the prime objective before us of course at all times of keeping the "process on stream." Thus our deductions are usually clouded in regard to the exact cause and effect. We have learned the hard way, however, that there are certain things that can be done with safety and other things that cannot be done with safety. When results are good we conceal our ignorance in the term "good practice"; and when bad, in the term "bad practice." When all is said and done we may as well admit that we still do not know much about the actual mechanism involved, and our knowledge to a large extent is based on a succession of case histories.

The furnaces which will be covered in this discussion are all of the continuous, regenerative type, common to the glass container industry, using the gob-feed process. These are of more or less conventional design comprising a melter and a refiner (or nose); the latter being separated from the melter by bridgewall and throat below the glass line, and by shadow wall above the glass line. A regenerator chamber on either side of the furnace setting, of course, affords heat recovery from outgoing combustion gases. Finished glass flows off the refiner through the forehearths for final temperature conditioning, and thence into the feeder bowls. The glass compositions are of the ordinary soda-lime variety in the range common to the container industry. The following data concerning Furnace "Heat-Up" covers the first phase of the complete paper on Furnace Operation and Control.

Since the subject of furnace operation should logically start with the heating up of a new furnace after a repair or construction job, it will be well to describe here a technique which we have developed and procedure settled upon as representing "best practice."

In Fig. 1 is shown a view of the regenerator arches over the checker setting on one furnace at the end of a fire. This furnace is of very rigid, heavy construction. The arch has failed in the first two ports. This defect showed up soon after the furnace was put into operation and progressively worsened as time went on. The void above the arch, however, was packed and at the end of the fire the arch was actually found to be quite strong as evidenced by the difficulty experienced in knocking it in.

After a process of elimination it was finally decided that the damage was done in the furnace heat-up; wherein an oil burner was placed in the end of the regenerator, over top of the checkers, and a very hot flame carried at that point. At any rate the same has not re-occurred since then.

It is reasonable that a furnace should be heated up for constant rate of "let out" or expansion. In Fig. 2 is shown a family of time-temperature curves which were calculated for constant rates of expansion ranging from 0.010 to 0.025 inches/ft./day. Below about 900° F. the slope of the silica expansion curve of course is controlling. But beyond that point the slope for other refractory materials begins to overtake that of the silica curve and they in turn become controlling.

Each of the curves of Fig. 2 has been used as shown, on a variety of furnaces of different sizes. The curve for 0.010 inches/ft./day is unreasonably long. On the other hand, 0.025 is too short and trouble is encountered in controlling the rate of heat-up so as to be able to stay

Fig. 1.

on this curve. If it is necessary to heat up in eight days or less, one might as well draw a simpler straight line and endeavor to stay on that. The curve considered the ideal is the one for 0.018 inches/ft./day. In Fig. 3 (page 36) is shown an actual furnace heat-up based on the 0.018 curve, for a furnace which happens to be fired with oil. A detailed description of the procedure follows:

After the furnace is finished, it is swept clean and about 20 tons of cullet is laid on the floor of the melter, in two furrows—the only purpose of which is to provide glass to seal the bottom joints and also to float the starting fill later on. Too much cullet is not advisable owing to the difficulty of transmitting heat through the pile.

One burner with control valve is placed under each port, in the checker setting at a point just above the rider arches at the bottom. In the case of double checkers, one burner in the same position under each port on the outside (air checker) and one burner at the same level in the end of the inside checker (gas checker) suffices. Either light oil or natural gas is used. Approximately ¾ million cubic feet of the latter is enough for the job, dependent upon the size of the furnace.

For practical use in the plant it is desirable to keep the procedure as simple as possible and with the minimum of extra instruments. A single rod gage is usually put up at three points along the center line of the melter crown and one point on the refiner crown to indicate distance of crown rise.

At the start a high temperature thermometer is suspended through each expansion joint in the crown to indicate atmospheric temperature on the underside and also for check on low temperature thermocouple readings. The course to be followed is usually plotted on the potentiometer charts—using two potentiometers, one for low range and the other for high range.

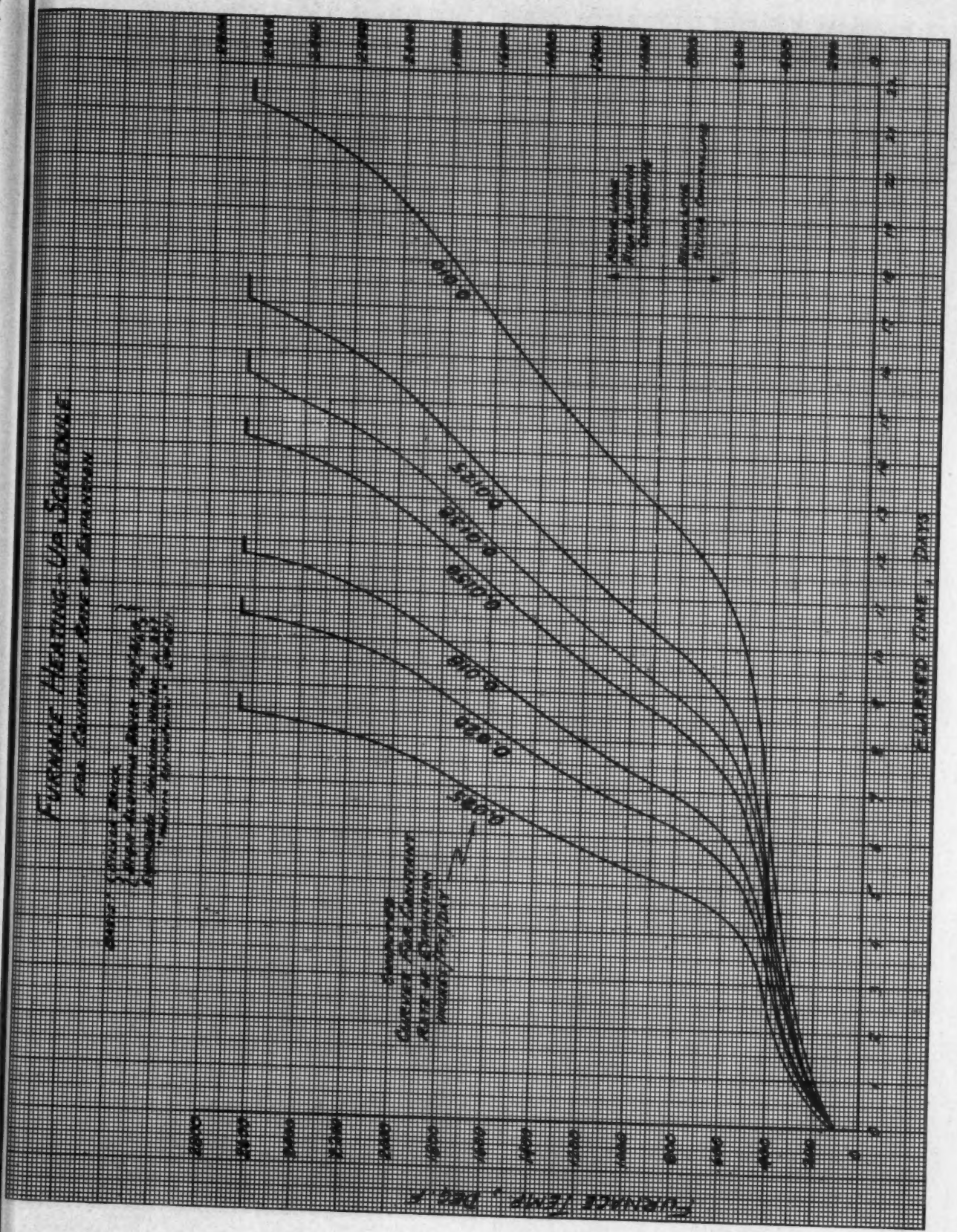
The furnace is started with the stack damper closed tightly and the reversing valve (or valves) on dead center, drawing enough air for combustion up through the checkers on both sides. Combustion gases find their way out through the joints and out through the forehearth openings. A few hours drying time is allowed after the furnace is bricked up, and the planned heat-up curve starts from 100° F.

Referring again to Fig. 3, in the neighborhood of 150° F. it is necessary to begin letting out the cross crown rods; at 200° F. the long crown rods and port rods; at 350° F. the corner jack bolts and doghouse jack bolts; at 400° F. all jack bolts; at 550° F. the forehearth rods. All points must be gone over continually, of course, to make free movement of the structure possible. In this regard it is a good idea in the building of the furnace to place strips of paper or graphite on sliding surfaces such as on the angle iron support for the port floor. The atmospheric thermometer readings, of course, are discontinued in the neighborhood of 550° F. before the joints close entirely. Most of the crown expansion is out below about 900° F. of course. It is pretty difficult to carry the furnace much beyond 1,000° F. with the aid of the checker burners alone.

Accordingly it is necessary to put a booster flame in the melter itself. In the case of the furnace of Fig. 3, which is fired from the rear wall, one burner adjacent to the center line of the furnace was lighted on light oil. With a producer gas-fired or natural gas-fired furnace it is normal practice to insert three burners in the melter —two through peep-hole blocks at the rear end, one at the bridge.

In the region of 1400° F. the furnace is tested for draft by throwing the reversing valve over to one side or the other (the checker burners having been shut off on the outgoing side) and raising the stack damper a few inches. A lighted taper should show suction into the melter. If no drawing is evident it will be necessary to either build a fire in the base of the stack or introduce a steam jet. However, neither should be done prior to this point because it would thereafter be impossible to keep the checker burners lighted by reason of the suction leakage around the stack damper, even in its closed position. At any rate it is desirable to put heat into the stack at about this point regardless of draft test since an air lock has been known to form later on.

Having checked the draft, Bunker "C" oil is admitted through the main burners (lighted up as needed) and the normal furnace reversals begun. It is best to have all checker burners turned off at this point, since it will otherwise be necessary to light up those burners on the up-coming side and turn off those on the outgoing side with each reversal.



(Continued on page 36)

GLASS THROUGH TIME

An Exhibit of the Baltimore Museum of Art

Ancient Egyptian and Greco-Roman Glass. Courtesy of Johns Hopkins University and Walter Art Gallery, Baltimore.

"Glass Through Time," the first of a series of large loan exhibitions, was displayed in the main galleries of the Baltimore Museum of Art from October 6 to November 19.

Bridging the centuries, from early Egyptian, Syrian, Greek and Roman creations down to some of the latest and most exquisite pieces turned out recently by artisans at Steuben Glass here in America, the exhibit was the most comprehensive of its kind ever shown in Baltimore.

Nucleus of the exhibition was provided by a collection, mostly early French and Italian pieces, about 150 in all, which was a gift to the Museum a few years ago from Mrs. W. W. Crocker of Burlingame, California, and which had not previously been put on exhibition. A collection of Egyptian and Roman glass was loaned by the Walter Art Gallery and Hopkins University. The Syrian glass in the show was assembled from a number of out-of-town collections. The Maryland Historical Society loaned a group of Bohemian glass, and a fine representative showing of Early American, Stiegal, Amelung, Sandwich and Jersey glass was assembled from local private collections and other sources, as well as early English, Dutch, German, Italian and Irish.

One whole section of the exhibit was given over to Modern American and foreign glassware, both utilitarian and decorative. Baltimore glass manufacturers and local dealers were represented. Some five hundred examples of glassware of every age and country, ranging in size from delicate miniature flasks to large modern glass sculptures, were shown. The illustrations show examples of the field covered.

Gilded and Enamelled Mosque Lamp, 14th Century Syrian Glass. Courtesy H. Kevarkian, New York.

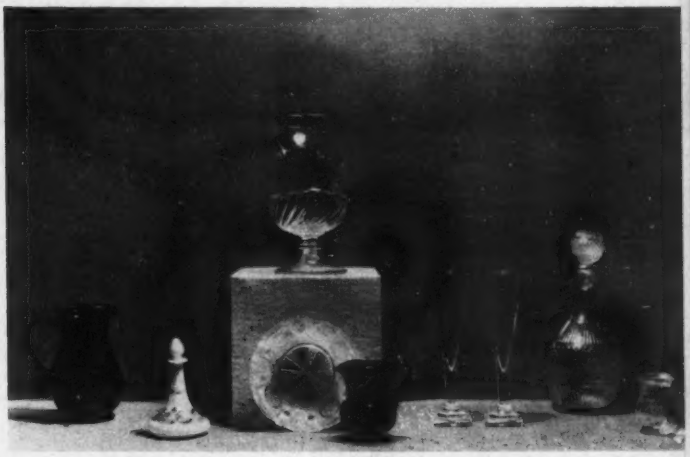
Early Venetian and Murano Glass. Part of permanent collection of Baltimore Museum of Art.

Eighteenth Century English Glass. Courtesy of Dr. James Bardley, Jr.

A Dutch Stippled Goblet ascribed to David Wolff and dated 1784. Courtesy Walters Art Gallery, Baltimore.

A Louis XIV Engraved Pitcher. Part of permanent collection of Baltimore Museum of Art.

Early American Glass—South Jersey, Stiegel, Amelung and Sandwich. Courtesy of Dr. James Bardley, Jr.



Etched clear flint glass Pitcher and two large Flips. Eighteenth Century, Stiegel type, American. Bequest of Miss Jane James Cook to the Baltimore Museum.

Swedish Contemporary Glass by Orrefors. Courtesy A. J. van Duyteren, New York.

Pair of Waterford Celery Jars, Eighteenth Century. Courtesy Dr. James Bardley, Jr.

Engraved Platter and Bowls made by Steuben Glass. Courtesy Mr. and Mrs. George Nomroe Moffert, Queenstown, Md.

SURVIVAL OF U. S. HAND-MADE GLASSWARE DEPENDS ON TARIFF PROTECTION

A review of tariffs and trade agreements as they affect the Hand-Made Illuminating, Table and Ornamental Glassware Industry

By H. L. DILLINGHAM

Business Manager, American Glassware Association

PART I

EDITOR'S NOTE: This first installment presents a comprehensive outline of factual data and the history of tariff regulations and trade agreements as they affect the United States hand-made table and illuminating glassware industry. The second installment, scheduled for the next issue of THE GLASS INDUSTRY, will deal with the actual effect of tariffs on this section of the glass manufacturing industry from a standpoint of American labor and manufacturers. No attempt has been made in this two-part article to cover the subject of tariffs as they pertain to scientific and optical glassware since these products come under entirely different tariff schedules.

In much of the current economic and political discussion concerning tariff and reciprocal trade agreements for the promotion of freer exchange of goods in international commerce, the handcraft industries, of which hand made glassware is one, seem to have been overlooked. The underlying facts relating to the importation of hand made products into this country, therefore, are not as well understood as they should be, since maintenance of tariffs is most important if the large number of men and women now engaged in producing hand made products in this country are to have continuous employment during the postwar period. In the United States at least 60 per cent of the manufacturer's cost of production of hand made illuminating, table, and ornamental glassware is wages paid to employees. Hand made workers' average wages in this country are about four times the wages paid in the average foreign factory. United States plants cannot continue in business very long, in competition with foreign hand-made ware, unless this great difference in wages can be equalized. This statement, simply and tersely, presents the fundamental reason why United States hand made glassware manufacturers are greatly concerned regarding the future tariff and trade agreements policy which this government will declare at the close of the present war, for then foreign glass manufacturers again will compete for the United States market.

From 1789, when the first United States tariffs were established by the Continental Congress, up to the present time, the difference between foreign and United States wage rates have been recognized. To equalize them, there constantly has been a U. S. tariff on imported hand made glassware. These rates have varied from time to time, sometimes higher and sometimes lower, depending upon the national economic policy being fostered by the party in power at the time of enacting United States tariff legislation. The important fact is that for 155 years the principle of equalizing United States and foreign glassware wages scales has always been recognized in our foreign trade economy.

The last major revision of tariff legislation was made by Congress in 1930, which act is known as the "Smoot-Hawley Tariff" or the "Tariff Act of 1930." Much discussion has centered about it during the past ten years. The tariff rates established in it were developed after searching hearings and much government fact-finding regarding production costs in this country and in competing foreign glass making countries. The following tariffs on hand made illuminating, table, and ornamental glassware were enacted: (excerpts from the Tariff Act of 1930)

		Rate of duty ad valorem
"Par. (c)	Illuminating articles of every description, finished or unfinished, wholly or in chief value of glass, for use in connection with artificial illumination:	
	Prisms, glass chandeliers, and articles in chief value of prisms	60%
	Chimneys	55%
	Globes and shades	70%
	All others	60%
	Provided, That parts not specially provided for, wholly or in chief value of glass, of any of the foregoing shall be subject to the same rate of duty as the articles of which they are parts.	
"Par. (d)	All glassware commercially known as plated or cased glass, composed of two or more layers of clear, opaque, colored, or semi-translucent glass, or combinations of the same	60%
"Par. (f)	Table and kitchen articles and utensils, and all articles of every description not specially provided for, composed wholly or in chief value of glass, blown or partly blown in the mold or otherwise, or colored, cut, engraved, etched, frosted, gilded, ground (except such grinding as is necessary for fitting stoppers or for purposes other than ornamentation), painted, printed in any manner, sand-blasted, silvered, stained, or decorated or ornamented in any manner, whether filled or unfilled, or whether their contents be dutiable or free	60%
"Par. (g)	Table and kitchen articles and utensils, composed wholly or in chief value of glass, when pressed and unpolished, whether or not decorated or ornamented in any manner or ground (except such grinding as is necessary for fitting stoppers or for purposes other	

than ornamentation), whether filled or unfilled, or whether their contents be dutiable or free..... 50%

Ornamental glassware is not mentioned in the tariff but it has been interpreted by the Treasury Department that ornamental glassware most generally is placed on a table (not necessarily dining) and, therefore, comes within the intent of paragraphs (f) and (g), and United States imports have been so appraised.

All of these glassware tariff rates in the 1930 Act are on an ad valorem basis. There is lack of knowledge of just how an ad valorem duty is levied. Under section 402 of the Tariff Act of 1930, "Value of Merchandise" is defined for the purpose of the Act, as follows:

"SEC. 402. VALUE.

"(a) BASIS.—For the purposes of this Act the value of imported merchandise shall be—

(1) The foreign value or the export value, whichever is higher;

(2) If the appraiser determines that neither the foreign value nor the export value can be satisfactorily ascertained, then the United States value;

(3) If the appraiser determines that neither the foreign value, the export value, nor the United States value can be satisfactorily ascertained, then the cost of production;

(4) In the case of an article with respect to which there is in effect under section 336 a rate of duty based upon the American selling price of a domestic article, then the American selling price of such article.

* * * *

"(c) FOREIGN VALUE.—The foreign value of imported merchandise shall be the market value or the price at the time of exportation of such merchandise to the United States, at which such or similar merchandise is freely offered for sale to all purchasers in the principal markets of the country from which exported, in the usual wholesale quantities and in the ordinary course of trade, including the cost of all containers and coverings of whatever nature, and all other costs, charges, and expenses incident to placing the merchandise in condition, packed ready for shipment to the United States."

Ad valorem duty on articles imported under paragraph 218 (c), (d), (f), and (g), based on the above definition, is the seller's invoice value of the article including packing costs in THE COUNTRY WHERE GLASSWARE IS PURCHASED FOR IMPORTATION INTO THE UNITED STATES times the rate of duty specified in the Tariff Act of 1930.

Many persons unfamiliar with the subject believe that United States ad valorem duties are based on the United States value of the article at port of entry or on United States cost of production. That is an error. While the duty as shown in the Tariff Act may seem high, it actually is much less than it first appears since it is figured on foreign value of the merchandise.

For example: An imported glass tableware article selling at retail for $1.00 in this country might have the following customary markup included in the price the consumer pays for it:

26.25c—cost of article in country of origin plus packing charges
15.75c—60% IMPORT DUTY
8.00c—transportation cost to point of shipment, ocean freight, insurance, consular and other fees

50.00c—cost price to retailer, landed in U. S. duty paid
50.00c—markup for retail cost of selling, transportation charges, etc., in this country

100.00c—price paid by consumer.
$1.00

Based on the United States consumer price, the duty is 15¾ per cent and on the cost price to the retailer is 31½ per cent. These amounts are somewhat less than the unfounded popular conception often expressed, that "60 per cent ought to be enough for any industry."

The Tariff Act of 1930 continued to be the basis for levying all duties on imports until Congress on June 12, 1934, enacted an amendment to it under the caption "Part III—Promotion of Foreign Trade." This amendment now is popularly referred to as the Reciprocal Trade Agreements Act. It permitted the president to reduce or increase tariff rates established in the Tariff Act of 1930 up to one-half (50 per cent), as stated in the following excerpts from the amendment:

" PART III—PROMOTION OF FOREIGN TRADE

SEC. 350. (a) For the purpose of expanding foreign markets for the products of the United States (as a means of assisting in the present emergency in restoring the American standard of living, in overcoming domestic unemployment and the present economic depression, in increasing the purchasing power of the American public, and in establishing and maintaining a better relationship among various branches of American agriculture, industry, mining, and commerce) by regulating the admission of foreign goods into the United States in accordance with the characteristics and needs of various branches of American production so that foreign markets will be made available to those branches of American production which require and are capable of developing such outlets by affording corresponding market opportunities for foreign products in the United States, the President, whenever he finds as a fact that any existing duties or other import restriction of the United States or any foreign country are unduly burdening and restricting the foreign trade of the United States and that the purpose above declared will be promoted by the means hereinafter specified, is authorized from time to time—

(1) To enter into foreign trade agreements with foreign governments or instrumentalities thereof; and

(2) To proclaim such modifications of existing duties and other import restrictions, or such additional import restrictions, or such continuance, and for such minimum periods, of existing customs or excise treatment of any article covered by foreign trade agreements, as are required or appropriate to carry out any foreign trade agreement that the President has entered into hereunder. No proclamation shall be made increasing or decreasing by more than 50 percentum any existing rate of duty or transferring any article between the dutiable and free lists. The proclaimed duties and other import restrictions shall apply to articles the growth, produce, or manufacture of all foreign countries, whether imported directly, or indirectly: Provided, That the President may suspend the application to articles the growth, produce, or manufacture of any country because of its discriminatory treatment of American commerce or because of other acts or policies which in his opinion tend to defeat the purposes set forth in this section; and the proclaimed duties and other import restrictions shall be in effect from and after such time as is specified in the proclamation. The President may at any time terminate any such proclamation in whole or in part.

* * * *

SEC. 2. (b) Every foreign trade agreement concluded

pursuant to this Act shall be subject to termination, upon due notice to the foreign government concerned, at the end of not more than three years from the date on which the agreement comes into force, and, if not then terminated, shall be subject to termination thereafter upon not more than six months' notice.

(c) The authority of the President to enter into foreign trade agreements under section 1 of this Act shall terminate on the expiration of three years from the date of the enactment of this Act.

* * * *

SEC. 4. Before any foreign trade agreement is concluded with any foreign government or instrumentality thereof under the provisions of this Act, reasonable public notice of the intention to negotiate an agreement with such government or instrumentality shall be given in order that any interested person may have an opportunity to present his views to the President, or to such agency as the President may designate, under such rules and regulations as the President may prescribe; and before concluding such agreement the President shall seek information and advice with respect thereto from the United States Tariff Commission, the Department of State, Agriculture, and Commerce and from such other sources as he may deem appropriate."

This amendment was passed at a time when Congress was groping for something it could do to get the country out of one of its worst business depressions. Increase in foreign trade seemed to be one of the aids and Congress rallied to the support of this new legislation. Many members at the time it was passed, perhaps did not realize just how the new power they had granted the President would be used. It seemed reasonable to them that *reciprocal* and *mutually* beneficial agreements made with another country to extend our foreign trade would mean that much more added production in our factories. Little was said about the tariff reductions made for that particular country being extended by proclamation to *all other countries in the world* (except those which were discriminating against United States goods), without those other countries making some direct tariff concessions on United States exports to them, though each country must extend "most favored nation" treatment to the U. S. and, therefore, cannot make a tariff concession to another country without giving it to U. S. exporters on the same article.

When the first trade agreements were made, immediately the President by proclamation and under the authority of the "most favored nation clauses" in previous legislation extended all of the benefits in tariff reduction made to the principal country to all other nations in the world exporting similar goods to this country. This has been the practice of the President in the case of all trade agreements that have been made with the 27 countries under the Trade Agreements Act of 1934 except in the Cuban first trade agreement. Those nations other than the principal country with which the trade agreement is made, get all of the tariff reductions that are made without making any tariff reductions on the articles included in the agreement in their own tariff schedules.

The first trade agreement made with any foreign country which included any reduction in glassware tariffs was with Sweden. That agreement became effective on August 5, 1935, and, under its terms, all glassware provided for in Par. 218 (f) "when primarily designed for ornamental purposes, decorated chiefly by engraving, and valued at not less than $1.00 each" was granted a reduction from 60 per cent to 30 per cent ad valorem, a cut of one-half (50 per cent) of the rate as authorized in the Tariff Act of 1930. On the same date the Swedish agreement became effective the President proclaimed that the imports of similar goods imported into the United States from any other country (including Japan) would be given the same reduction that had been extended to Sweden. Germany was excluded from benefits of all trade agreements a few weeks after the Swedish trade agreement became effective. This proclamation made the agreement multi-lateral. It is difficult to see where such an agreement is a reciprocal trade agreement except with the principal country; it is just a cut in United States tariff rates on the products included in the Swedish trade agreement.

Following is a tabulation of the Par. (f) glassware imports from Sweden as a result of that trade agreement:

Year	*From Sweden*	*All Countries Incl. Sweden*
1935	$ 424	$ 434
1936	2,247	3,494
1937	1,805	4,647
1938	2,969	4,205
1939	3,483	6,650
1940	3,038	4,367
1941	1,273	2,873
1942	Not released	1,376
1943		1,537 - 11 months

No further change was made in tariff rates in Par. 218 (c), (d), (f), and (g) until the Trade Agreement with Czechoslovakia became effective on April 16, 1938, when the following reductions were made along with many other reductions on glassware imported under other paragraphs:

ILLUMINATING GLASSWARE

United States Tariff	*Rate of Duty Before Agreement*	*Rate of Duty Under Agreement*
Par. 218 (c). Illuminating articles of every description, finished or unfinished, wholly or in chief value of glass, for use in connection with artificial illumination:		
Prisms, glass chandeliers, and articles in chief value of prisms	60%	30%
Chimneys	55%	30%
Globes and shades	70%	45%
All others	60%	Reclassification
Reclassification		
Wall brackets, candelabras, and candlesticks, all the foregoing designed for electrical illumination	...	30%
Others	...	40%
Provided, That parts not specially provided for, wholly or in chief value of glass, of any of the foregoing shall be subject to the same rate of duty as the articles of which they are parts.		

PLATED OR CASED GLASSWARE

United States Tariff	*Rate of Duty Before Agreement*	*Under Agreement*
Par. 218 (d). All glassware commercially known as plated or cased glass, composed of two or more layers of clear, opaque, colored, or semi-translucent glass, or combinations of the same	60%	45%

BLOWN OR DECORATED GLASS TABLEWARE AND OTHER GLASS ARTICLES

United States Tariff	*Rate of Duty Before Agreement*	*Under Agreement*
Par. 218 (f). Table and kitchen articles and utensils, and all articles of every description not specially provided for, composed wholly or in chief value of glass, blown or partly blown in the mold or otherwise, or colored, cut, engraved, etched, frosted, gilded, ground (except such grinding as is necessary for fitting stoppers or for purposes other than ornamentation), painted, printed in any manner, sand-blasted, silvered, stained, or decorated or ornamented in any manner, whether filled or unfilled, or whether their contents be dutiable or free, except articles primarily designed for ornamental purposes, decorated chiefly by engraving and valued at not less than $8 each	60%	50%

PRESSED AND UNPOLISHED GLASS TABLEWARE

United States Tariff	*Rate of Duty Before Agreement*	*Under Agreement*
Par. 218 (g). Table and kitchen articles and utensils, composed wholly or in chief value of glass, when pressed and unpolished, whether or not decorated or ornamented in any manner or ground (except such grinding as is necessary for fitting stoppers or for purposes other than ornamentation), whether filled or unfilled, or whether their contents be dutiable or free	50%	25%

The Czechoslovakian Trade Agreement generally reduced tariff rates on almost every kind of glassware, not only for Czechoslovakia which made concessions in its import tariffs for other United States exports but by Presidential proclamation, this trade agreement tariff reduction was extended to all "most favored nations in the world." In 1935, Germany had been stricken from the "most favored nations" list and did not receive the benefits of this agreement. Why it was necessary to encourage Czechoslovakian imports of glassware under this agreement is not evident because the imports from Czechoslovakia on glassware *without any tariff aid* had grown steadily on these articles. The increase in illuminating glassware was 314 per cent from 1935 to 1937 inclusive, and 175 per cent in table glassware, as shown in table on page 38.

The Czechoslovakian Trade Agreement was short-lived for Germany overran that country early in 1939 and on April 22nd of that year, the agreement was declared non-operative by Presidential proclamation. The agreement was not cancelled and undoubtedly it could again be made effective by Presidential confirmation although, due to political and economic changes which have taken place in Czechoslovakia, during the war, it is probable that such action would not be taken without public hearings for interested parties.

When this Czechoslovakian agreement was declared non-operative, all United States tariff reductions which had been made in it to Czechoslovakia and by proclamation to all other favored nations in the world, were likewise terminated. The rates established in the Tariff Act of 1930 then were applicable again to all imports except for glassware entering within the terms of the Swedish and United Kingdom Trade Agreements, the latter becoming effective January 1, 1939.

During the fall of 1938, our government conducted many hearings on the prospective United Kingdom Trade Agreement. When the agreement finally was consummated, the following tariff reduction in Par. 218 (f) by reclassification of the articles was made as follows:

CUT OR ENGRAVED BLOWN GLASSWARE

United States Tariff	*Rate of Duty Before Agreement*	*Under Agreement*
Par. 218 (f). Table and kitchen articles and utensils, and all articles of every description not specially provided for, composed wholly or in chief value of glass, blown or partly blown in the mold, or otherwise, or colored, cut, engraved, etched, frosted, gilded, ground (except such grinding as is necessary for fitting stoppers or for purposes other than ornamentation), painted, printed in any manner, sand-blasted, silvered, stained, or decorated or ornamented in any manner, whether filled or unfilled, or whether their contents be dutiable or free, except articles primarily designed for ornamental purposes, decorated chiefly by engraving and valued at not less than $8 each	50%* ad val.	
Reclassification Par. 218 (f). Table and kitchen articles and utensils, and all articles of every description not specially provided for, composed wholly or in chief value of glass, blown or partly blown in the mold or otherwise, if cut or engraved, however, provided for in paragraph 218 (f) of the Tariff Act of 1930, and valued at not less than $1 each (except articles primarily designed for ornamental purposes, decorated chiefly by engraving and valued at not less than $8 each)	...	45% ad val.

*The 1930 Tariff Act established 60 per cent cut to 50 per cent by Czechoslovakia Trade Agreement.

(*Continued on page* 38)

The Glass Factory of 194x is shown here in model form. The offices, showroom, and employee service areas are in the portion of the building in the foreground. The irregular outline of the central mass is due to the roof monitors which light the manufacturing floor. The raised section at the rear is caused by the height of the furnace room, with the circular storage bins immediately behind. Area for 300 per cent expansion of the plant is provided in open area shown at right. Freight cars enter the building where shipping and unloading operations can be protected from Canada's severe winters. A "greenbelt" of trees shields the plant from the railroad.

GLASS FACTORY OF 194x

The complete design of the ideal Glass Factory of 194x was the subject of the prize winning Thesis at a leading Canadian School of Architecture in 1944. With the assistance of Mr. Samuel Moss, manager, and Mr. Henry Hartman, chemist, of Glass Containers Limited, Winnipeg, Canada, John C. Parkin, a graduating student in architecture at the University of Manitoba, Winnipeg, was able to make a complete and accurate study of the operation of a modern glass container plant.

In addition, study was made of five modern American plants to enable Parkin to incorporate the most desirable features of each. The result was an efficient streamlined factory enclosing under a single roof adequate receiving and shipping facilities for both rail and truck transport, expansive storage for raw materials, and a technically correct straight-line production line from storage bin to packaged product, together with the necessary sub-assembly lines, such as mould production, and carton assembly, and finally adequate warehouse space for the packaged ware.

Across the front of the building at a mezzanine level were placed the main offices of the "dream plant," and on the ground floor an assembly hall and a large showroom where not only the products of this plant could be shown to advantage, but also the many glass products distributed by Hobbs Glass Ltd., the parent company of Glass Containers Ltd. Believing that optimum, not minimum employee service facilities were desirable, such amenities as a roof deck recreation area and cafeteria were included as well as the usual lockers, rest rooms, and medical department. An actual lot was chosen for the plant in line with making the problem as realistic as possible. The plant was placed on well-landscaped grounds on an important arterial highway, provided with adequate trackage, and where the striking functional architecture of the building would be of considerable advertising value. The plan is so designed that it is possible to ultimately triple the output of the plant, without interrupting production.

The complete thesis problem was of four months duration, and ran simultaneously with the regular subjects of the fifth year course. The solution consisted of eleven large linen sheets of working drawings and details, a 200-page specification, a 100-page analysis of glass plant and general factory design, a bound collection of revelant literature, and the large colored model shown in the photograph.

Much of the steel work in a rigid frame truss used over the manufacturing area was designed by a graduating Civil Engineer who closely collaborated with the Architect in the preparation of his own thesis.

The solution won Parkin the Bachelor of Architecture Thesis Prize, and with other work the University Gold Medal in Architecture. Now graduated, Parkin is working on postwar planning in Canada, but at the war's conclusion hopes to spend a year at an American university on post-graduate work and to ultimately specialize in industrial architecture.

INVENTIONS AND INVENTORS

A Summary of United States Patents of Interest to the Glass Industry Issued During November

Furnaces

Figs. 1 and 2 show the workings of a skim compartment for a plate glass tank designed by Wilbur F. Gaunder of Mount Vernon, Ohio, and described in patent 2,363,954 assigned to the Pittsburgh Plate Glass Co. The invention is applied to a glass melting tank containing the molten glass bath moving from a rear batch-charging end 21 toward a drawing end of the tank where there are front drawing chambers 24 and side drawing chambers 25. Heat is applied by fuel fed through side ports 27. Before the glass enters the forward portion of the tank it passes under a refractory floater 28 which extends across the narrow neck portion of the tank and is so shaped as to skim off and direct toward the tank sides any surface impurities or undissolved batch. The invention is concerned in a considerable part with the design of skim kilns or compartments 30 located either in advance of or beyond the floater. Elements of their construction are shown in Fig. 2 which indicates how the skim kiln is traversed by a floater 35 and by a submerged bridge 40. The degree of submersion of these two elements is controllable. As suggested by the arrows the hot surface glass drifts toward the cooler masses in the kilns, and is drawn beneath the floater and over the top of the bridge. As it becomes cooler the surface glass in the kilns tends to path beneath the bridge and to move back to the body of the bath. Since studies of glass movement indicate that there is movement in the tank basin of the lower body of the bath back toward the charging end, the impurities along the marginal portions of the bath are thus believed to be returned to the hotter portions of the tank for further refinement.

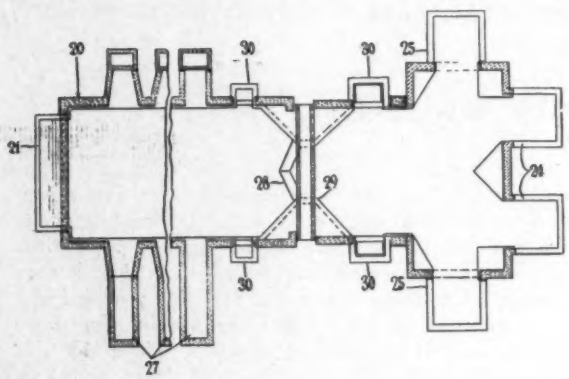


Fig. 1

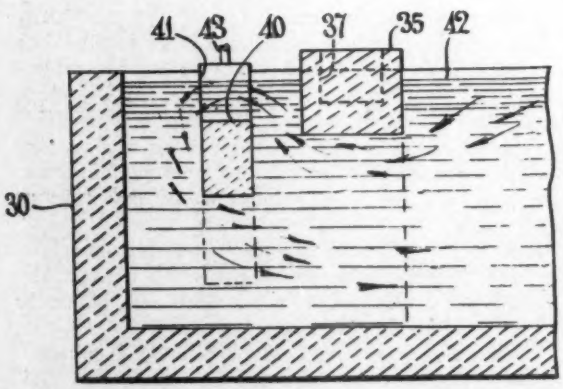


Fig. 2

Figs. 1 and 2. 2,363,954 : Gaunder. The upper view shows the plan of a plate glass furnace in which skimmed material is directed into skim compartments 30, which are detailed in the lower drawing.

Feeding, Forming and Shaping

In one method of forming ampoules from glass tubing a portion of the tubing is softened by a flame and this heated portion is stretched to reduce the diameter of the tubing, thus forming a neck which tapers from each end toward the middle. The stretched neck is considerably longer than necessary and in a subsequent operation the extra length is severed from the ampoule. A machine for carrying out this trimming operation is described in patent 2,362,115 assigned by Leon E. Cline of Vineland, N. J. to Kimble Glass Co.

Otto H. Samuelson and Anthony T. Zappia of Indianapolis received patent 2,363,999 for improvements in a continuous machine for forming containers. Much of the inventive detail is concerned with a blowhead for the finishing molds. The blanks are received by these molds with the neck already formed; the blowhead first admits air at sufficient pressure to form the bottle, then it momentarily closes the mold against the escape of this blowing air, and next opens the mold to the atmosphere and at the same time admits air under relatively high velocity and pressure which rapidly cools the bottle and readily escapes to the atmosphere.

Fig. 3 from patent 2,362,433 granted to John E. Ferguson and Cecil W. McCreery of Muncie, Ind. (Owens-Illinois Glass Co.) shows the manner in which their new nozzle 26 is used to supply properly treated atmosphere to the space between glass block half-sections at the time of joining. Details of the nozzle are not indicated by this view but include divergent slit-like apertures through which dehydrated air or other suitable gas is supplied to flush other gas from the block.

In another Owens-Illinois patent, 2,362,427, Russell G. Allen of Alton, Illinois, describes the operating mechanism for a machine of the Owens suction gathering type, in which there is provision for changing individual molds without stopping the machine. This has a very great advantage since it is then not necessary to take a lot of time in re-establishing temperature and operating conditions after the machine is again started.

Apparatus for systematically loading lehrs is covered by new patents issued to Anchor Hocking Glass Corp. and to Hazel-Atlas Glass Co. The first of these is 2,363,-681 assigned to the first named company by Wm. L. McNamara and F. Z. Fouse of Lancaster, O. A plan view of their apparatus is shown in Fig. 4 in which two

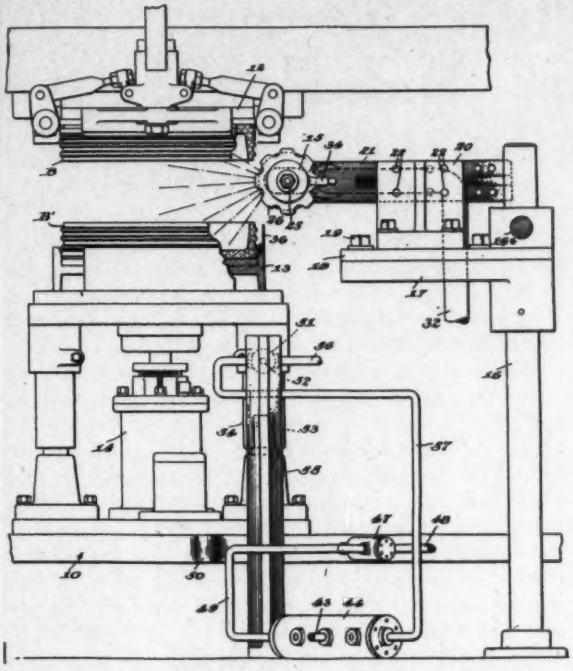


Fig. 3. 2,362,433 : Ferguson and McCreery. Nozzle for replacing air with dry gas in the half sections of glass blocks at the time of joining.

different shapes of bottles are moving alternately toward the series of gates which arrange them in spaced relationship. The swinging gate 44 serves first to separate the two bottle types. The round bottle shown against the gate will be deflected to the right while the next successive bottle will find the gate in such a position as to move it to the left. This gate and the succeeding ones are operated by the movement of the bottles which are being moved along with the conveyor belt. The guide elements are held in position by a superstructure which has no contact with the conveyor; it is not shown in Fig. 4. The following discussion of operation will deal only with the right hand half of the lehr loader, for convenience of illustration. Having passed the initial deflector the individual container proceeds to other gates. The gates which make up the continuous guide are so shaped and of such a nature that none of them will be opened until the first article, which contacts with the guide, reaches the rear or outermost end of the giude. At this time the first article will pass around the outer end of the outermost gate and engage a gate opening portion which will swing the gate open, the article which actuated the gate being moved along by the conveyor. This permits the second or next article, being moved along the continuous guide, to pass through the space, opened in the guide by opening of the first gate, and permits the article to engage the gate-opening portion of the next gate and open it. At the same time that the second article passes through such space, it will engage a gate-closing portion carried by the first gate and close it. This sequence of operations will continue until the forward or innermost end of the continuous guide is reached. Then the next article will again move to the outermost

(*Continued on page* 44)

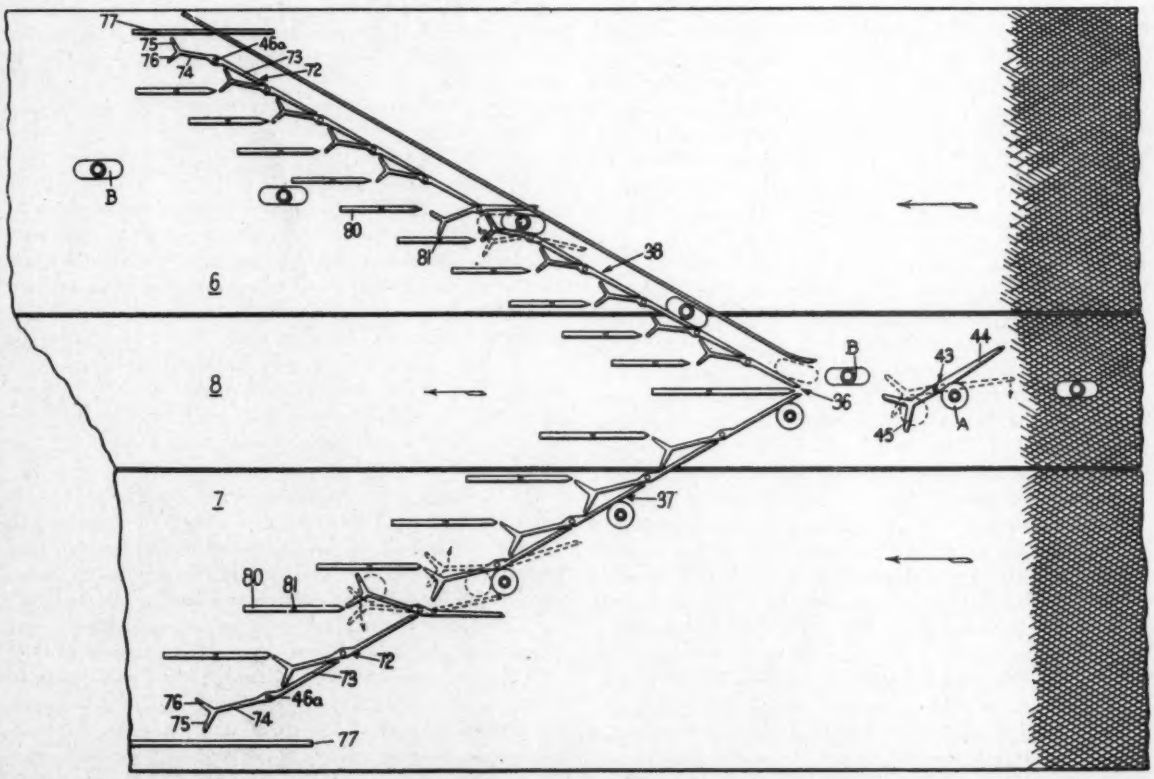


Fig. 4. 2,363,681 : McNamara and Fouse, Lehr loader which handles two sizes of ware and directs them to different sides of the conveyor.

GJ Research Digest

Practical Interpretations of Glass Technology

Glasshouse Stones

In the November, 1944, issue of *The Journal of the American Ceramic Society*, W. L. Fabianic presents a paper on glasshouse stones. This subject, in spite of all the papers published about it, still remains one of prime importance to the glass manufacturer. This is based upon the economic truth that if the annual loss of ware caused from stoney glass can be decreased it represents a dollars and cents saving with no additional loss or overhead.

In this paper the various types of stones found under operating conditions in soda-lime bottle glass furnaces are discussed. The possible source of each type of stone is considered along with general methods for its identification and, most important, its elimination. In addition, auxiliary aids which help in the examination of stones are described. Excellent photomicrographs are also given which illustrate the various types of stones.

In brief, the types, sources and cures for the stones found in commercial practice are as follows: 1—Cullet stones. Factory cullet which is contaminated with refractory material (either tank quarried or lehr cullet) is a prolific source of stones as the refractory particles are difficult to dissolve in the glass. Commercial cullet is often contaminated with cinders, brick, concrete and metals. Decorated ware sometimes causes metallic blobs on the ware due to the ceramic color becoming reduced. These defects may be eliminated by the proper selection and cleaning of the cullet by washing and forking. If the cullet is suspected of being the source of the stones a large sample should be examined for such contamination.

2.—Refractory Stones. The elimination of stones of refractory origin such as nephelite, clay, mullite, silica and zirconia is, in each case, a special problem all by itself and general recommendations are of little aid. Slag streams may be chilled by the application of wind or other cooling mediums. Stones from the metal line can be decreased by maintaining a constant glass level, a uniform temperature and flame length in the furnace. Refiner stones may be due to a local flame impingement or to excessive refiner temperatures. Stones of refractory origin may be decreased by raising the furnace temperature slightly. This is based on the fact that such an increase in temperature does not loosen new stones to a greater degree than it dissolves the old ones.

3—Batch Stones. In general the best way to keep free of batch stones is to use raw materials of fine enough grain size. The grain size should be such that they go into solution under conditions imposed by the maximum rate of pull intended for the furnace. Materials of a refractory nature should not be present in the batch ingredients. The usual batch stones are sand grains, andalusite grains, feldspar lumps, lime lumps and heavy minerals which may be present in the sand or other quarried materials.

4—Devitrification Stones. Quartz, tridymite, cristobalite, wollastonite, pseudo-wollastonite, diopside and devitrite are the usual devitrification stones found in soda-lime glasses. Improper liquidus point which is influenced by temperature gradient, batch inhomogeneities, incorrect glass composition, viscosity of the glass and rate of cooling, reheating of the glass, surface volatilization, incorrect furnace design and other causes will all contribute to the formation of stones of this type. The elimination of a siege of devitrification stones in reality boils itself down to each case becoming a special problem. This naturally assumes that the composition and viscosity of the glass in question are such that the liquidus point is within the working range of the operating conditions. If they appear in flint glass a temperature gradient of the complete furnace should be taken. Knowing the liquidus temperature one can judge whether any part of the furnace is cool enough for devitrification to occur. If the trouble occurs in colored glass, the temperature check should be made and the load checked. If a change in load has been made it often moves out stagnant areas of glass which has become devitrified. Shutdowns, water patches and batch errors have also been known to cause devitrification stones. The correction in these cases is obvious.

5—Miscellaneous Stones. This group contains defects such as sulphate blisters, metallic stones, blisters and coloring material. Each presents an individual problem but an intelligent diagnosis by the petrographer usually results in the proper steps being taken to clear up the difficulty.

Fumes or Vapors from Molten Glasses

Molten glasses are considered as solutions of more or less volatile constituents, particularly as regards the vapor pressures and the rates of evaporation of the more volatile ones. At the temperatures employed in glass melting and working, considerable amounts of material, mainly fluxes, are vaporized from the melt. Most of the materials which thus distill off have boiling and melting points higher than those temperatures which exist in certain parts of the checker and flue systems. Considerable amounts of these materials will therefore condense out as slag or dust.

C. A. Bradley, Jr. (*Bulletin of the American Ceramic Society*, October, 1944) using the data of Preston and Turner, has calculated the amount of material which may be lost by volatilization (disregarding losses due to "dusting" of the batch) from commercial melting units.

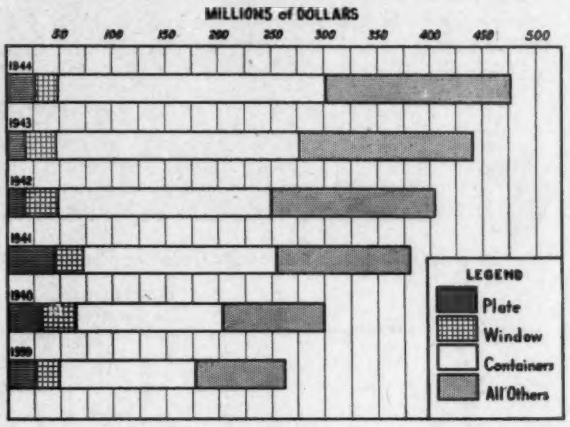
In the case of an alkali-lead oxide-silica glass it was found that the loss of lead by volatilization would be 1.14 lbs./ft.^{2}/day at 1400° C. and 0.447 lbs./ft.^{2}/day at 1300° C. For a tank with a melting end of 400 sq. ft. and a working end of 150 sq. ft. and assuming that one-half of the melting end is not covered with melting batch the lead loss at these temperatures would be in the order

(*Continued on page* 42)

CURRENT STATISTICAL POSITION OF GLASS

GI THE GLASS INDUSTRY'S INDEX

Production Ten Months, January Through October



Activity in the glass industry during October showed a slight increase over that of September. As reported by the Production Index, production for October was $48,000,000, as compared with $47,000,000 for September, and $47,000,000 for October, 1943. Output for the first ten months of 1944 was $476,000,000, comparing with $440,000,000 for the same period of last year—an increase of about 8 per cent.

Plate glass production for the month of November was 7,618,959 sq. ft., as reported by the Hughes Statistical Bureau. This is approximately a 16 per cent decrease from the figure reported for October, but a slight increase over November of the preceding year. A total of 94,924,718 sq. ft. has been produced during the first eleven months of the year, compared to 66,981,620 sq. ft. reported for the same period of 1943—an increase of 41 per cent.

Glass container production for November was reported at 7,967,358 gross, by the Glass Container Association of America. This is a decrease of approximately 8 per cent from the figure shown for October, but an increase of slightly more than 2 per cent over production in November, 1943. During the first eleven months of 1944 glass container production was shown at 93,126,793 gross, as compared to 85,036,111 gross for the same months in 1943—an increase of around 8 per cent.

Shipments of glass containers during November totalled 7,787,433 gross, a decrease of 4 per cent from October, and of about 1 per cent from November of last year. Total shipments reported for the first eleven months of 1944 were 89,063,561 gross—an increase of slightly more than 2 per cent over the same months of 1943.

Inventories on glass containers for November were 5,345,852 gross, approximately the same figure reported for October and an increase of 16 per cent over November, 1943.

Automatic tumbler production for November totalled 4,696,718 dozens, a decrease of 18 per cent from that figure reported for October and of 3 per cent from November of last year. Shipments of automatic tumblers for the month of November were 4,480,635 dozens, a decrease of 10 per cent from the October shipments and approximately the same as the figure for November, 1943. Finished stocks on hand at the end of November were shown at 7,376,441 dozens.

Table, kitchen and household glassware: Manufactuers' sales of machine-made table, kitchen and household glassware for November were reported at 3,271,035 dozens, a slight decrease from the figure reported for October and an increase of about 67 per cent over November, 1943.

GLASS CONTAINER PRODUCTION AND INVENTORY

(All Figures Are in Gross)

		Production Nov. 1944	*Stocks Nov. 1944*
Foods: Medical & Health Supplies; Chemical, Household, Industrials; Toiletries & Cosmetics	Narrow Neck	2,576,547	1,958,252
	Wide Mouth	2,683,774	1,631,394
Dairy Products		244,656	342,279
Home Canning		59,947	356,949
Beverages		535,605	353,567
Beers		880,468	213,309
Liquors		680,359	352,806
Wines		247,323	117,417
Packers' Tumblers		58,679	19,879
Total		7,967,358	5,345,852

GLASS CONTAINER SHIPMENTS

(All Figures Are in Gross)

Narrow Neck Containers

	Nov. 1944
Foods	529,048
Medicinal & Health Supplies	857,604
Chemical, Household, Industrials	548,382
Beverages	508,390
Beers	874,025
Liquors	681,430
Wines	226,538
Toiletries & Cosmetics	524,597
Sub-Total (Narrow Neck)	4,750,014

Wide Mouth Containers

Foods	2,249,925
Dairy Products	242,179
Home Canning	31,999
Medicinal & Health Supplies	232,834
Chemical, Household, Industrials	103,234
Toiletries & Cosmetics	117,410
Packers' Tumblers	59,838
Sub-Total (Wide Mouth)	3,037,419
Total Shipments	7,787,433

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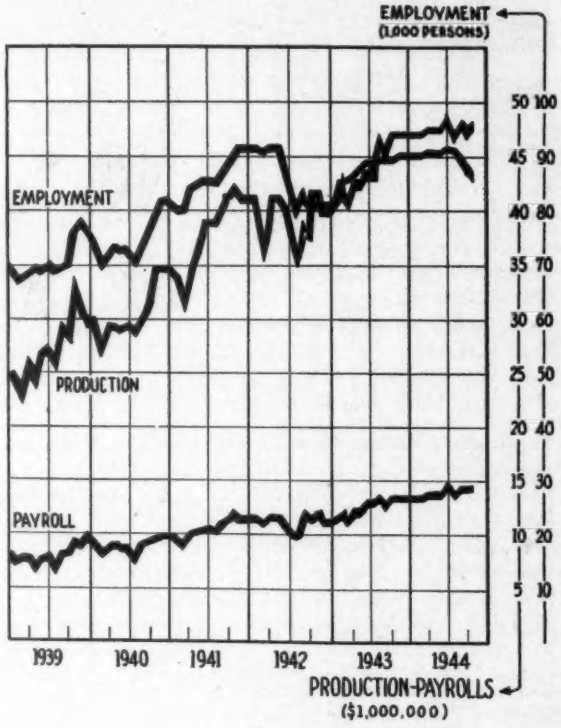
Miscellaneous glass products manufactured in October were estimated at $17,000,000—the same as that reported for September. This is the same figure also as that shown for October of 1943.

Employment and payrolls: The total number of persons employed in the glass industry during October was 87,100. This compares with 88,300 employed in September and 90,000 employed during October of last year.

Payrolls for October were estimated at $14,750,000 as compared with $14,500,000 paid out in September. During the first ten months of 1944 glass manufacturers have paid approximately $141,750,000 in salaries.

GJ THE GLASS INDUSTRY'S INDEX

Monthly Trends Through October, 1944



COLUMBIA DEVELOPS NEW CHEMICAL

The Columbia Chemical Division of the Pittsburgh Plate Glass Company recently reported the development of a new chemical, butadiene monoxide, a colorless, relatively volatile, liquid, organic compound possessing both carbon to carbon unsaturation and an alpha-epoxide group.

The compound undergoes a variety of reactions characteristic of those two organic groups which render it useful in diverse organic processes, for example, in the production of polymerizable alkyd resins, unsaturated alcohol ethers and esters, and other organic chemicals and pharmaceuticals.

NEW EQUIPMENT AND SUPPLIES

MAGNIFIERS FOR TESTING AND INSPECTION

A new tool for the glass industry is offered by an assembly of wide field magnifiers with built-in illuminating units, operated by battery and by electric control, containing 7-power, 20-power and 40-power magnifiers.

These magnifiers provide laboratories and inspection departments with an efficient means of observing details invisible to the unaided eye. With these three magnifications and choice of battery or current for illumination, many problems can be readily solved.

They are useful for inspecting glass makers' raw materials for particle size, uniformity and foreign matter; for inspecting the surface of glass for texture, crazing, etc., and for detecting minute amounts of undissolved suspended matter in glass.

FLEXIBLE ELECTRIC HEAT UNIT

The H. & A. Manufacturing Co., Inc., of Buffalo and Binghamton has perfected a new flexible, "serpentine" electric heat unit. Because it can be coiled in close or in widely spaced turns around pipes and cylinders, spiraled around moulds, or fitted to odd contours, H. & A. engineers believe the new element will find innumerable applications.

Heat may be applied through direct contact of the unit or may be transferred through clips or fixtures of various designs. Applications already have been designed for de-icing installations on airplane engine nacelles, and on hangar doors; also on moulds where critical temperatures must be maintained, and on melting pots of unusual shapes.

NEW VIBRATION MOUNT

Rexon, a radically new type of vibration mount, characterized by extreme simplicity in design and application, and by virtual indestructibility in use, has just been announced by Hamilton Kent Manufacturing Company, a unit of U. S. Stoneware, Akron, Ohio.

Only two standard types of Rexon mountings are required to effectively isolate all kinds of vibration. All that an engineer need know is the total weight, the weight distribution of the machine to be insulated, and whether the direction of the vibration is vertical or horizontal.

Rexon mounts can be easily and quickly installed without use of special angles, brackets or radius rods, and without increasing the overall height of the machine more than 1½ to 2 inches.

ELECTRIC CONTROL INTRODUCED TO ELECTRONIC LINE

The Brown Instrument Company announces the introduction of electric contact controls for circular chart electronic potentiometers.

The electric contact controllers will be available in two forms. One will contain a locking-in type relay, designed primarily for electric furnace control and the second type, without a relay, is designed for direct control of motorized valves, operation of signalling devices, and for applications requiring a "dead" neutral.

CATALOGUES RECEIVED

The Askania Regulator Company, Chicago, has just published bulletin #101 on Ratio Control. It points out the manner in which Askania Ratio Control may be applied to many types of proportioning applications in the process industries.

A novel feature of the bulletin is the orifice calculation chart. This offers engineers a quick and easy method of orifice size determination for air and gas flows.

Harbison-Walker Refractories Company, Pittsburgh, is distributing a folder entitled "H-W Refractories" which contains information concerning refractories which are being produced at their Kentucky-Southern Ohio district plants from highest quality flint and plastic clays from their own clay mines in those states.

The folder also contains information concerning Harbison-Walker Insulating Fire Brick and High Temperature Bonding Mortars which are produced in their other plants not located in Kentucky or Ohio.

Libbey-Owens-Ford Glass Company, Toledo, Ohio, has an attractively designed 23-page booklet, "Solar Houses—an architectural lift in living" for distribution. The use of large areas of glass in the construction of homes is interestingly explained and illustrated with artists' drawings and photographs, and there is a list of questions and answers as to the advantages to be gained from Solar housing.

North American Philips Company, Inc., New York City, has announced a new 12-page booklet describing X-ray diffraction techniques and applications. Diagrams, typical diffraction films, and several tabulations are given in order to show how NORELCO X-ray Diffraction equipment is used for identification, research and production.

Outstanding features of NORELCO X-ray diffraction equipment are clearly explained. Special pages are devoted to powder, back-reflection-focusing, and low-angle scatter cameras. In addition, the booklet describes briefly and simply how X-ray diffraction films can be interpreted.

Peabody Engineering Corporation, New York City, has just prepared a new bulletin, No. 802, describing the Peabody Type M Oil Burner. It describes and illustrates the mechanical and operating features of the burner, for natural or forced draft operation and for use with mechanical, wide range mechanical or steam atomizers.

Armstrong Cork Company, Building Materials Division, Lancaster, Pa., has just issued a new edition of a booklet on Insulating Fire Brick.

The booklet, which describes five types of fire brick for temperatures up to 2600 degrees F., features new data on suspended arches and walls and tailor-made arches and domes. Photographs and sketches illustrate the text.

Diatromaceous Earth and Insulating Concrete and Ingot Mold Insulation also are described in the booklet.

The B. F. Goodrich Company, Akron, Ohio, has a six page folder on the Punch-Lok method of banding and splicing electrical applications.

The folder describes the tools used in the Punch-Lok method, lists sizes of preformed and open end clamps available in Everdur, a copper brass alloy for electrical use, and tells in step-by-step detail how to apply the Punch-Lok bands on many electrical jobs such as connecting, splicing, reinforcing, tieing and repairing lines.

CATALOGUE & BULLETIN SERVICE

Current catalogues and manufacturers' service bulletins reviewed in this department may be obtained by writing to THE GLASS INDUSTRY.

FURNACE OPERATION AND CONTROL . . .
(*Continued from page* 21)

Schedule for Furnace "Heat-Up"
Elmira No. 1—Sept. 1944

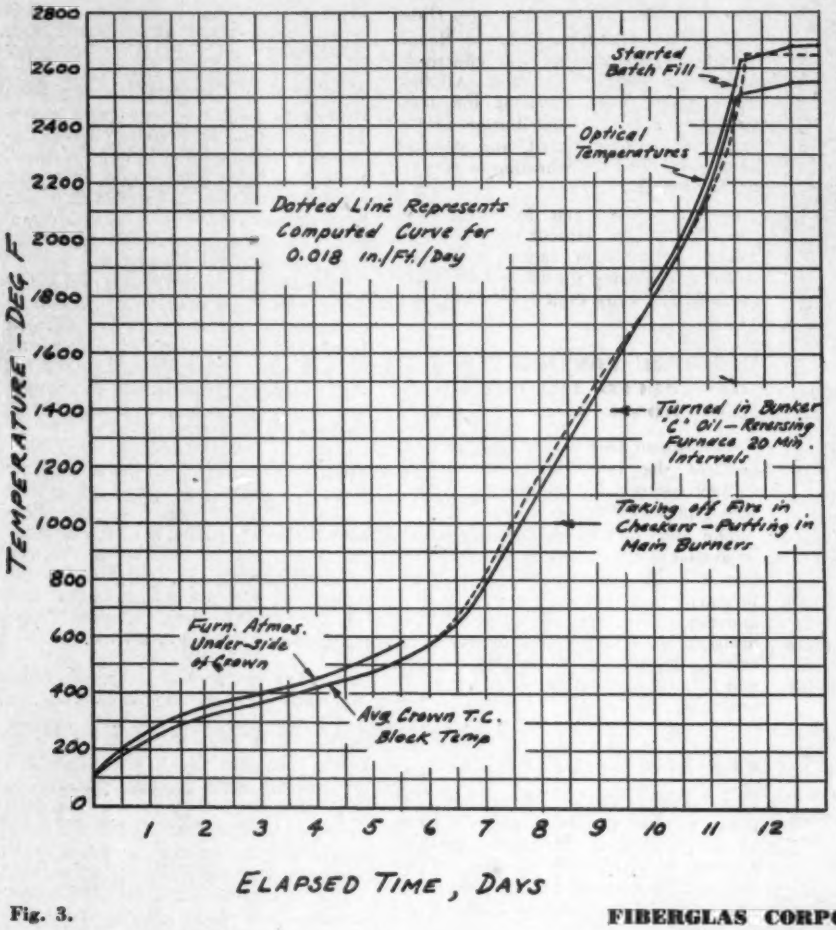


Fig. 3.

The procedure during this transition period is carried out in much the same manner on natural gas-fired furnaces. However, on producer-gas it is best to carry the furnace all the way up to 1800° F. with the aid of the auxiliary burners: the two valves are thrown over leading to the one side of the furnace. The air vent into the gas valve has at this point been closed off entirely, however, whereupon the stack draft test is made again, as before with the checker burners shut off on the outgoing side. The checker burners on the up-coming side are kept lighted, however, in both the air and gas checkers, the latter as merely a precaution to provide ignition on the way up. The draft established, the bulkhead is removed from the producer gas duct and the disk raised on the gas valve, admitting gas to the furnace. All auxiliary burners are then turned off and the furnace continued on its normal reversal cycles.

Optical temperature readings are begun at about 1800° F. Also at this time the refiner which has previously been coming up evenly in temperature with the melter will begin to lag behind. It is desirable therefore to place a burner in the refiner for assistance, to avoid the possibility of a frozen throat after the batch fill is once started.

At about 2200° F. one can start filling or covering the expansion joints and start putting on the crown insulation brick. The latter job, of course, is much more pleasant if started at room temperature but there is some advantage too in watching the crown over-all during the heat-up. The furnace fill is started at about 2600° F. filling as fast as batch melts and runs away—but not so fast as to fill the furnace full of unmelted batch. About three to four days are consumed in filling the furnace, depending upon when the start-off is wanted.

Taken altogether, the method described for heating the furnace up under pressure has worked very well indeed. The curve for 0.018 in./ft./day has been used on several different furnaces and in each case the furnace has been put in operation in perfect condition.

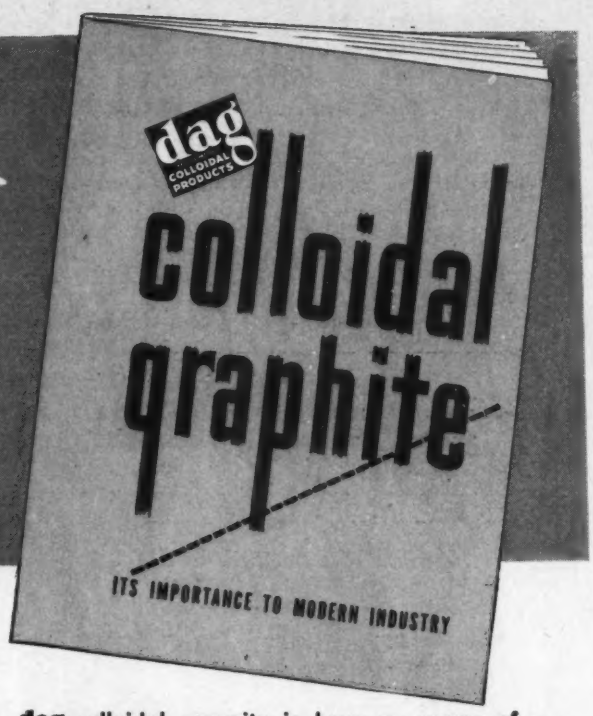
FIBERGLAS CORPORATION ISSUES YEAR-END STATEMENT ON VETERAN RE-EMPLOYMENT

Programs now being developed by industry forecast a smooth and rapid absorption of men and women discharged from the armed forces, in marked contrast to the chaotic condition prevailing after the First World War, according to a statement issued by the Owens-Corning Fiberglas Corporation, which has just completed a detailed and comprehensive veteran re-employment program.

Part of the Fiberglas Corporation's program is aimed at re-employing all the company's temporary employees who left the company to enter military service, as well as providing for the re-employment of regular employees, since the temporary employees are not covered by the re-employment provisions of the Selective Service Act.

• The Glass Industry wishes to correct a mistake made on page 521 of the November, 1944, issue. Credit for authorship of the "Chemical Engineering Catalog" was given Professor E. Raymond Riegel which was an error as this catalogue has no author.

This FREE booklet will help you SOLVE



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- "Washboarding"
- Higher Lustre Finish
- Sticking of Glass Working Tools
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(Lubricants containing **dag** colloidal graphite are available from major oil companies.)

TARIFF PROTECTION FOR U. S. GLASSWARE

(*Continued from page 28*)

This agreement continues in effect to date and, by Presidential proclamation, the tariff reduction applies to all most favored nations as in preceding trade agreements. The annual amounts of glassware coming into the United States under Par. 218 (f), as defined in the agreement, are as follows:

	1939	1940	1941	1942	1943
United Kingdom	$ 2,761	$ 3,014	$5,472	(Not released)	
Total—All Countries	20,642	10,311	8,829	$9,965	$2,054 (11 mos.)

Due to the war, diminishing amounts of this glassware have been imported in total, but the United Kingdom has improved its position in spite of the transportation difficulties. It is probable that some of the ware reported as imported for consumption may have been placed in bonded warehouses before the war and has been withdrawn for consumption during the war years. The amount of ware which has become competitive with United States ware under this section has not as yet become an important factor in the United States market.

Until January 30, 1943, no further reductions were made in glassware under Par. 218 (c), (d), (f), and

(*Continued on page 42*)

IMPORTS

CZECHOSLOVAKIAN AND TOTAL ALL COUNTRIES INCLUDING CZECHOSLOVAKIA FOR PAR 218 (c), (d), (f), and (g)

Par. 218					1938		1939	
					Regular	Agreement	Regular	Agreement
c) Prisms	1934	1935	1936	1937	1/1-4/16	Rate	4/22-12/31	Rate
Czechoslovakia	$ 16,618	$ 21,479	$ 43,079	$ 38,441	$ 8,327	$200,953	$ *	$ 39,262
Total U. S. Imports	21,067	26,478	53,735	50,410	19,584	214,423	153,402	45,485
Lamp Chimneys								
Czechoslovakia	5,167	15,140	9,118	14,209	1,191	10,394	*	28
Total U. S. Imports	19,896	25,191	18,689	30,038	8,820	11,932	7,894	756
Globes and Shades								
Czechoslovakia	45,747	51,389	76,639	120,162	28,003	97,464	*	41,860
Total U. S. Imports	58,710	73,921	102,655	151,413	32,908	98,481	16,968	43,045
All other illuminating ware								
Czechoslovakia	67,447	109,394	191,547	386,237	59,734	135,763	87	10,917
Total U. S. Imports	88,941	148,481	227,218	431,154	63,329	159,448	90,946	15,844
(d) Plated or cased glass								
Czechoslovakia	2,292	92	134	563	—	28,164	*	6,078
Total U. S. Imports	3,814	1,109	459	1,065	1,290	38,641	960	11,303
(f) Polished								
Tableware & kitchen utensils								
Blown or partly blown and pressed								
Czechoslovakia	271,111	220,667	307,475	520,849	67,038	288,379	526	44,656
Total U. S. Imports	772,640	738,701	910,043	1,365,027	257,155	709,165	561,073	278,204
All other ornamental, etc., ware blown or partly blown and pressed								
Czechoslovakia	163,943	255,932	481,800	687,825	140,839	389,016	513	56,641
Total U. S. Imports	717,169	857,577	1,227,184	1,556,048	379,197	657,844	510,472	171,667
(g) Unpolished								
Tableware & kitchen utensils								
Blown or pressed								
Czechoslovakia	67	2,108	2,188	2,907	632	19,928	*	2,603
Total U. S. Imports	818	5,443	5,637	8,001	4,456	22,156	4,666	4,395
All other ware blown or pressed								
Czechoslovakia	12,189	8,527	8,027	18,576	15,473	467	2,580	—
Total U. S. Imports	79,012	92,715	65,809	67,604	44,380	1,378	29,138	103
(–) Polished								
Engraved ornamental glassware valued at $8.00 each or over								
Czechoslovakia	(1)	—	205(2)	248(2)	—	362(2)	—	—(2)
Total U. S. Imports	(1)	434	3,494(2)	4,647(2)	—	4,205(2)	—	6,650(2)

*Much Czechoslovakian ware reported as German after invasion.

(1) Included in the classification, Unpolished, All other ware.

(2) Agreement rate at 30%—Swedish Trade Agreement.

Source: Official import statistics obtained from "Foreign Commerce and Navigation", Bureau of Foreign and Domestic Commerce, Department of Commerce.

FRED DIXON SALES MANAGER FOR CLEVELAND FOUNDRY COMPANY

The appointment of Fred W. Dixon, Jr., as Sales Manager, has just been announced by the Cleveland Foundry Company.

Mr. Dixon has had a long and varied career with many well known organizations, covering a twenty-seven year period. He started his career as a student engineer with the American Radiator Company in Buffalo and while there completed his studies in metallurgy. Other well known organizations with whom he has been associated are Jamestown Malleable Iron, Chain Belt Company, Western Foundry and the William H. Nicholls Company, foundry engineers.

Just prior to going to Cleveland Foundry Company Mr. Dixon served for more than twelve years as Sales Engineer and Assistant Sales Manager of the Gunite Foundry in Rockford, Illinois.

GENERAL ELECTRIC FORMS CHEMICAL DEPARTMENT

A new department in the organization of the General Electric Company, to be known as the Chemical Department, has been created by the Board of Directors and Dr. Zay Jeffries, technical director of the company's Lamp Department, has been elected a vice president in charge.

The new Chemical Department will assume responsibility for the operations pertaining to the Resin and Insulating Materials Division and the Plastics Division of the Appliance and Merchandise Department.

Dr. Jeffries began service with General Electric in 1914 as consultant with the National Lamp Works. From 1932 to 1936 he was also president of the Carboloy Co., Inc., a General Electric affiliate, and since then has been chairman of the board. Since 1936 he has been technical director of the Lamp Department.

• A fire on October 31, 1944, caused minor damages to the Cincinnati Plant of the Charles Taylor Sons Co., where P. B. Sillimanite and Taylor Zircon Refractories are produced. The fire started in the engine room where welders mere making repairs on a steam engine. After several days the plant was back in full production and orders are now back on a normal schedule.

• The Pittsburgh Corning Corporation has announced plans to double the capacity of its Foamglas plant at Port Allegany, Pennsylvania, to meet rapidly increasing demands for cellular glass insulation, an entirely new material first put into commercial production less than two years ago. The additions to the factory will ultimately cost about $750,000.

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METAL TO GLASS, VIA KOVAR

With the war dependent upon electronic tubes—millions of them—a single, unalterable fact of nature, the difference in expansion of metal and glass with heat, could have become an obstacle of the first order of magnitude had not Kovar, an alloy born in the Westinghouse Research Laboratories some ten years ago, come to the rescue. In some of these tubes the metal-to-glass areas are large—perhaps a square foot—and the tubes are worked almost up to the softening temperature of the glass to get the maximum power from them, so that small differences in co-efficient of expansion at the seal would immediately destroy a tube. Of the metals, only tungsten and molybdenum have co-efficients of expansion comparable to hard glass. Tungsten and molybdenum in many cases, are ruled out by difficulties of fabrication. Copper seals, while used successfully for some kinds of vacuum tubes, present numerous practical difficulties.

Kovar has been the lifesaver. It is an alloy of iron, nickel, and cobalt whose expansion with temperature closely parallels that of hard glass up to about 465 degrees C., where the glass begins to soften anyway. Making a Kovar seal is a simple matter and requires no extensive training of operators. The thoroughly-cleaned glass and the Kovar are simply heated in a gas flame, the oxidized Kovar worked into the softened glass, and the joint allowed to cool. The Kovar surface then provides a base for conventional soldering or brazing.

• George D. Sailer, secretary of the McKee Glass Company, has resigned, effective January 1. He has been associated with McKee Glass for 45 years. Mr. Sailer started with the glass industry in 1899 as office boy in the plant of the National Glass Company. When the McKee Glass Company was organized by the late A. J. Smith in 1908 he was made secretary.

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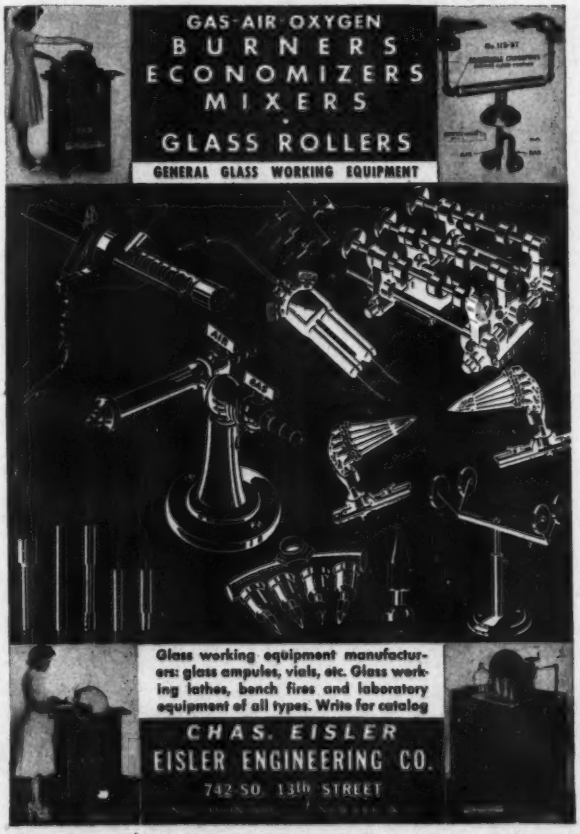
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"LIVE" BLOOD SHIPPED IN PORTABLE FIBERGLAS INSULATED REFRIGERATORS

An indication of how the modern science of refrigeration is meeting the demands of war is afforded by the performance of the portable refrigerators developed by the Navy for air transportation to the most distant fronts of "live" human blood collected by the Red Cross.

Live blood is blood as it comes from the donor's veins. In some cases, even though blood plasma has saved a wounded man during the initial shock period, subsequent heavy loss of blood has caused death because there wasn't enough blood left to carry needed oxygen.

Transfusions of live, or whole, blood are required to meet such situations, but until recently it was not possible to keep live blood for more than a week. making transportation to distant war fronts impracticable, even with planes available to carry it.

Two developments have completely changed the picture. It was found that if a solution of citric acid, sodium citrate, and dextrose was added to the live blood, it would retain 75 per cent of its original value for as long as twenty-one days. The Navy then developed a light, portable refrigerator that would keep the blood at a 40 to 50 degree temperature for over sjxty hours at a stretch.

The refrigerator consists of a plywood case lined with Fiberglas insulation two inches thick. In addition to providing an efficient barrier to the passage of heat, the glass fibers are extremely light in weight and do not pack down under shock or vibration, leaving gaps for heat to pass through.

• Dr. Max Miller, formerly Superintendent of Refractories at Basic Magnesium, Inc., Las Vegas, Nevada, has been placed in charge of the Research and Experimentation Department of Titan Abrasives Company of Chicago, manufacturers of Besly Titan Abrasive Wheels.

RESEARCH DIGEST . . .

(*Continued from page* 32)

of 295 lbs. per day. In the case of a soda-lime-silica glass containing 0.83 per cent SO_3 it was calculated that the volatilization of alkali from a tank having a melting area of 600 sq. ft. operating at a temperature of 1450° C. and a working end area of 200 sq. ft. operating at a temperature of 1300° C. would be about 16.04 lbs./day.

If the fuel contains sulphur the amount of dust formed will be greater as the volatilized alkali and sulphur oxides from the sulphur in the fuel can also combine and form sodium sulphate which will condense in the checkers, flues or cooler portions of the furnace.

TARIFF PROTECTION FOR U. S. GLASSWARE

(*Continued from page* 38)

(g). Then the Mexican Trade Agreement became effective and the rates of duty on so-called "bubble" glass were reduced as follows:

United States Tariff	*Rate of Duty Before Agreement*	*Rate of Duty Under Agreement*
Par. 218 (f). Table and kitchen articles and utensils, and all articles of every description not specially provided for, composed wholly or in chief value of glass, blown or partly blown in the mold, or otherwise, or colored, cut, engraved, etched, frosted, gilded, ground (except such grinding as is necessary for fitting stoppers or for purposes other than ornamentation), painted, printed in any manner, sand-blasted, silvered, stained, or decorated or ornamented in any manner, whether filled or unfilled, or whether their contents be dutiable or free (except articles, if cut or engraved, valued at not less than $1.00 each); any of the foregoing commercially known as bubble glass, if produced otherwise than by automatic machine	60% ad val.	30% ad val.

The establishment of this 30 per cent rate was a reduction of one-half (50 per cent) of the 60 per cent rate previously applying under the Tariff Act of 1930. Preliminary reports of imports from Mexico under this trade agreement are as follows:

Mexico	1943	5 Mos. 1944
Table and kitchen articles and utensils	$ 58,847	$21,427
Other ornamental, etc.	54,115	14,548
Total	$112,962	$35,975
Total All Countries		
Table and kitchen articles and utensils	$ 58,847	(Not released)
Other ornamental, etc.	54,267	
Total	$113,114	

A larger volume of bubble glass than had been anticipated has been imported under the trade agreement. The sale of bubble glass probably has been inflated by the fact that many hand made lines have been discontinued by United States manufacturers, and importers went to Mexico to fill their requirements, substituting it for crystal glassware which they could not secure in this country.

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Latest development of General Chemical Company in the field of fluorides is this revolutionary new type of Hydrofluoric Acid container—prepared expressly for packaging Reagent HF produced by General's Baker & Adamson Division.

Laboratory chemists hail this transparent plastic bottle with its exclusive pouring and sealing features as an outstanding advancement which combines safety and utility to meet every requirement when using this corrosive acid.

Immediately available. . . . Why not order a standard carton of 25 one-pound bottles with the next lot of B & A quality reagents for your laboratory, or fill your requirements *now?*

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Old-fashioned wax bottle for HF that has proved inadequate over the years.

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★ No more problem and annoyance of not knowing amount of HF in bottle.

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GENERAL CHEMICAL COMPANY ... FIRST IN FLUORIDES

INVENTIONS AND INVENTORS . . .
(*Continued from page* 31)

or rear gate and the sequence of operations will be repeated. Thus, the gates are opened automatically by contact of the articles with the guide. Each article passing through a space opened by one gate will contact with the gate-opening portion of the succeeding gate and the gate-closing portion of the preceding gate. Thus, this article-guiding and arranging unit will serve to arrange automatically the articles in a series of longitudinally spaced rows on the lehr conveyor.

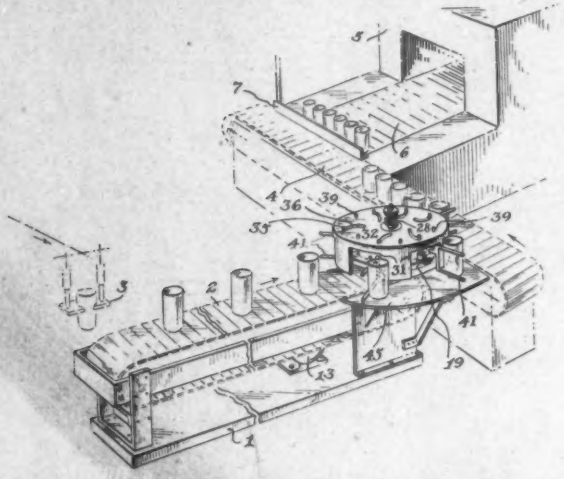


Fig. 5. 2,362,132 : Haub. Another glass transfer device for handling ware from one conveyor to another in feeding a lehr.

The Hazel-Atlas transferring apparatus is described in patent 2,362,132 which was granted to Edwin Haub of Zanesville. The nature of the invention is illustrated by Fig. 5 in which it can be seen that the containers are moved from one conveyor to another by a motor driven transfer wheel which has a series of paddles for moving the ware. These paddles become retractable upon having completed delivery of the article.

The General Electric Co. is assignee of patent 2,363,067 granted to James R. Lait of Wembley, England, for a fired ceramic material adapted to be sealed to glass and consisting of a mixture of steatite (50 per cent minimum) and material from the group consisting of magnesia, zirconia, and zirconium silicate.

Methods and apparatus for forming a second flat precision surface on a prism at a specified angle to a polished first flat precision surface are disclosed in patent 2,363,544 assigned to The Perkin-Elmer Corp. by Halley W. Mogey of Stamford, Conn.

Cap sealing apparatus is detailed in patent 2,363,704 granted to Harry E. Stover of Connellsville, Pa. and assigned to Anchor Hocking Glass Corp.

Sheet and Plate Glass

Emmett L. Walters of Toledo, (Libbey-Owens-Ford Glass Co.) received patent 2,363,631 for a new type of bedding material to hold glass sheets while they are being polished. He eliminates plaster of paris and substitutes a soft yielding layer of flock material consisting of short fibers of cotton or similar material, preferably blown onto the tables, as a spray of dry material, or material in suspension, possibly together with adhesives.

William Peacock's patent 2,633,354, also assigned to Libbey-Owens-Ford, concerns a method of making mirrors in which separate solutions of silver ammonio nitrate and a reducing agent containing glyoxal are entrained into a jet of compressed air so as to atomize the two solutions and cause them to react to produce metallic silver which is immediately deposited upon the glass surface.

Still other Libbey-Owens-Ford patents issued during November were 2,363,429 to Clyde D. Lowry of Toledo for means of mounting glass panels upon a wall, and 2,363,578 to Watler G. Dieter of Toledo for a contactor unit for air conditioning systems. The latter utilizes closely spaced glass sheets over which is flowed the liquid which is used for humidification of the air.

In making a glass lined wooden tank for holding liquids a layer of asphalt is sometimes poured into the space between the glass plates and the wood, but troubles are experienced because foaming of the asphalt develops. George L. West of Pittsburgh (Pittsburgh Plate Glass Co.) relates in patent 2,364,014 how this trouble is prevented by double lining the wooden container with glass and pouring the asphalt between the two layers of glass.

Glass Wool and Fiber

In manufacturing glass fiber sliver for yarns Geo M. Lannan and Frank Vanucci of Newark, Ohio, (Owens-Corning Fiberglas Co) relate in patent 2,363,470 how the bundle of fibers is drawn through a trumpet shaped tube for shaping. Within the trumpet is a toe or splitter which shapes the sliver into a U form, after which the two edges are folded into the middle and pressure applied to consolidate the sliver in such a way as to eliminate the loose end fibers.

EDMUND GEORGI JOINS STAFF OF PENNSYLVANIA SALT

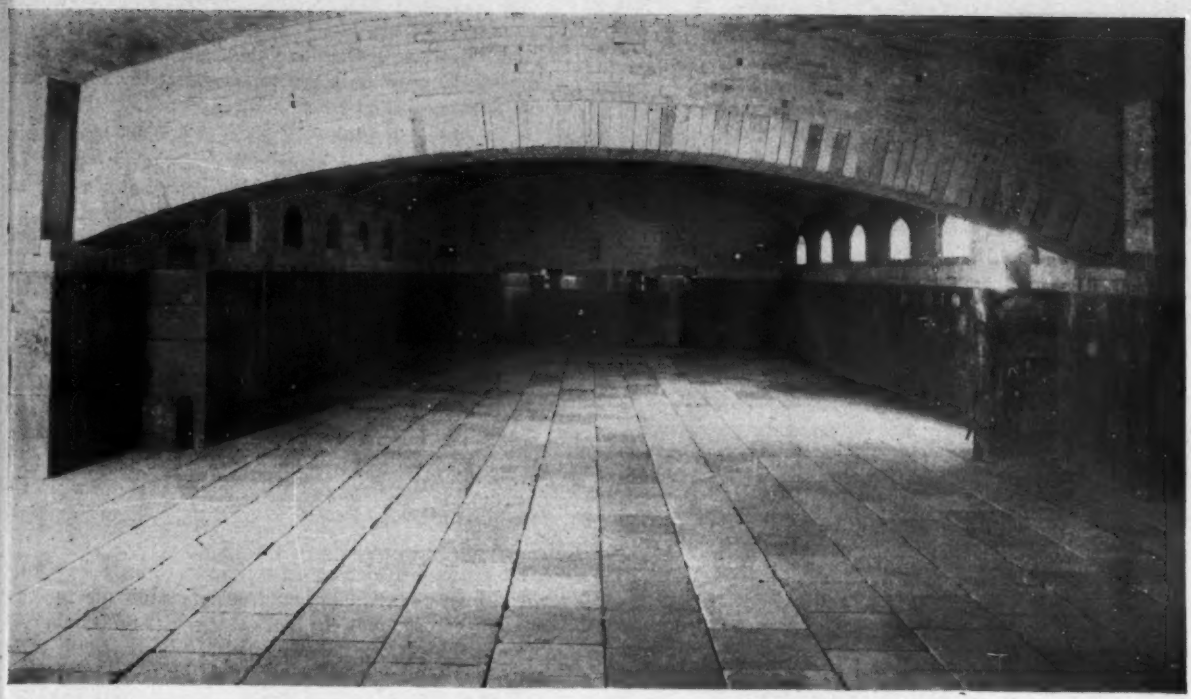
From a recent announcement by the Pennsylvania Salt Manufacturing Company it has been learned that Edmund A. Georgi, formerly Manager of Technical Development, Papermakers Chemical Department, Hercules Powder Company, has become associated with the Research and Development of that company as Director of Special Products Division.

The Special Products Division includes laboratory and field work in evaluation of new products, and in carrying out service work requested by Sales or Manufacturing Departments.

HIGGINS NAMED WESTINGHOUSE DIRECTOR

According to a recent announcement by Westinghouse Electric and Manufacturing Company, Harry B. Higgins, president of the Pittsburgh Plate Glass Company, has been elected to the Board of Directors of Westinghouse.

Mr. Higgins, who was elected president of Pittsburgh Plate in January, 1944, has been associated with that company since 1905, at which time he was employed as a stenographer. Mr. Higgins is also president and a director of the Pittsburgh Corning Corporation.



What About Corhart* Electrocast In The Window Glass Industry?

FOURTEEN years ago we published the photograph above. The furnace shown is a unit of one of the largest manufacturers of window glass in America. Through all the years since the first Corhart installation, this unit as well as all others belonging to this large company have been similarly constructed, with liberal use of Corhart products.

As a matter of fact, of the 32 window glass tanks in the United States, Canada and Mexico, 29 have complete Corhart Electrocast throughout the sidewalls. . . . The 3 remaining tanks are largely Corhart Electrocast but embody small quantities of other materials. . . . Four of the 32 have complete Corhart Electrocast bottoms, and most of them use Corhart Electrocast extensively in the superstructure.

Furnace life and highest quality glass are the reasons for this record of Corhart service to the window glass industry.

We would be happy to send detailed information—particularly to glass companies and engineers in South America and throughout the world.

Corhart Refractories Company, *Incorporated,* 16th and Lee Streets, Louisville 10, Kentucky.

*Not a product, but a registered trade-mark.

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For All Types of Glassware Moulds

OVERMYER MOULD CO. of PENNA.

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For Screw Machine Products

OMCO PRODUCTS CORPORATION

Springfield, Ohio

MAIN OFFICE . . . . WINCHESTER, INDIANA

DEATH OF WILLIAM STEVENSON

William Stevenson, Vice President in Charge of Production of the Pennsylvania Wire Glass Company at Dunbar, Pennsylvania, died on December 27.

He was born in Philadelphia, and in 1903 started his business career at the home office of the Company in Philadelphia. After a short while there, he was sent to the plant at Dunbar and later became Superintendent.

POTASSIUM CARBONATE TO BE ALLOTTED BY WPB

It is being freely and quite authoritatively predicted that potassium carbonate will be allotted by WPB in February of 1945. An order is being written for publication which will provide for usage in the following priority sequence: (1) Military "must" business; (2) Indirect military; (3) Essential civilian; and (4) Civilian. Each company will be required to show previous consumption and the type of end products in which this potash was used.

The military uses for potassium carbonate have increased enormously within the past few months for the manufacture of explosives and other secret military uses. It now has reached a point where the present supply fails to equal the demand and immediate action must be taken by WPB to divert the amount necessary for war material manufacturers.

★ **BUY WAR BONDS** ★

1907 was a great year . . .

and 1915 was one of unusual events

Transcontinental telephone communication was first established between New York and San Francisco—(the first conversation across the continent was held by Alexander Graham Bell and Thomas Watson) . . . The Lusitania was sunk by a German submarine—(114 Americans lost) . . . the Henry Ford Peace Ship sailed for Europe. Important things were happening for Banner Lime also, in its eighth year—Agriculture commended its unusual soil correction value; architects, its superior quality in building; industries, its uniformity and purity as a product ingredient. National Mortar & Supply Company, Grant Building, Pittsburgh, Pa. Established 1907.

THE OTTAWA SILICA COMPANY

OTTAWA. ILLINOIS

THREE PLANTS TO SERVE YOU

OPERATING YEAR AROUND

ALLINGTON APPOINTED TO POST AT WICKWIRE

The Wickwire Spencer Steel Company has just announced the appointment of H. C. Allington as Assistant General Sales Manager of Wickwire Spencer and its subsidiary the American Wire Fabrics Corporation.

Mr. Allington became associated with Wickwire in February, 1944, as Sales Research Engineer in charge of the development and expansion of markets for the Company's products. Prior to joining Wickwire Spencer, he was with the Logan-Allington Company, Inc., and the American Machine and Metals, Inc.

In his new position, Mr. Allington will continue his work on market development and expansion. He will also supervise the activities of the company's various sales divisions and develop policies in line with Wickwire Spencer's currently expanded operation.

HARRY KLUTH MANAGER OF PITTSBURGH PLATE WAREHOUSES

The Pittsburgh Plate Glass Company has announced the appointment of Harry R. Kluth as general manager of the company's seventy-seven warehouses.

Mr. Kluth started as an office boy for the company thirty-five years ago in its Philadelphia branch. In 1935 he was made manager and a year later district manager.

Succeeding Mr. Kluth in Philadelphia is H. E. Zoll, who has been with the company twenty-two years. He was assistant manager at Philadelphia.

ACID and ALKALI RESISTANT

Colors?

Colors with exceptional acid and alkali resistant properties for applied color labels have been developed by the O. Hommel Co. These Hommel Colors increase the life of the glass package many times and are available in an unlimited range of color shades. . . . Permanency and brilliance of the label after repeated washings in strong alkali and acid baths lead to repeat business. . . . Write us freely and frequently for samples and advice. . . . We are at your service.

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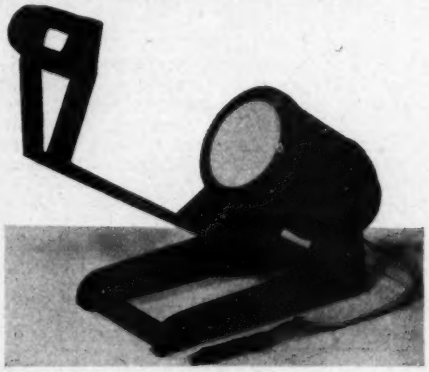

Polarizing field is of 6" diameter. The analyzing eyepiece is located 14" from the polarizer. The eyepiece is a rectangle 3¼" x 1" with a facility of vision far greater than any unit made previously by us. It can be swung to any position from the vertical to the horizontal.

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